

Transcript of the Testimony of

**JOHN FRAZIER**

November 29, 2022

AUGUST J. LEVERT, JR. FAMILY, LLC, ET AL v. BP AMERICA  
PRODUCTION COMPANY



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18TH JUDICIAL DISTRICT COURT  
 PARISH OF ST. MARY  
 STATE OF LOUISIANA

AUGUST J. LEVERT, JR.  
 FAMILY, LLC, ET AL  
 VERSUS NO. 78953  
 DIVISION: "A"  
 BP AMERICA PRODUCTION  
 COMPANY

The videotaped testimony of

DR. JOHN FRAZIER,

taken by the plaintiff, pursuant to  
 agreement and the within stipulation, via  
 Zoom, beginning at 9:01 a.m., on November  
 29, 2022.

BEFORE:

Lori B. Overland  
 Certified Court Reporter  
 In and For the State of  
 Louisiana

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A P P E A R A N C E S

FOR THE PLAINTIFF, via Zoom:

JONES SWANSON HUDDPELL & DASCHBACH, LLC  
 601 Poydras Street  
 Suite 2655  
 New Orleans, Louisiana 70130  
 BY: KEVIN E. HUDDPELL, ESQ.  
 and  
 JONES SWANSON HUDDPELL & DASCHBACH, LLC  
 One American Place  
 301 Main Street  
 Baton Rouge, Louisiana 70801  
 BY: JOHN T. ARNOLD, ESQ.

FOR THE DEFENDANT, via Zoom:

LISKOW & LEWIS, APLC  
 822 Harding Street  
 Lafayette, Louisiana 70503  
 BY: COURT C. VANTASSELL, ESQ. and  
 JOHN S. TROUTMAN, ESQ.  
 and  
 LISKOW & LEWIS, APLC  
 701 Poydras Street  
 Suite 5000  
 New Orleans, Louisiana 70139  
 BY: MARK R. DEETHARDT, ESQ.

3

ALSO PRESENT, via Zoom:

Gilley DeLorimier  
 Videographer

Brent Pooler  
 Wade Bryan  
 Matt Green

\*\*\*\*\*

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I N D E X

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1                    S T I P U L A T I O N  
2        It is stipulated and agreed by and  
3        between all parties that this deposition  
4        is hereby being taken for all purposes,  
5        pursuant to the provisions of the  
6        Louisiana Code of Civil Procedure.  
7        All formalities, including the reading  
8        and signing of the transcript by the  
9        witness, are hereby waived.  
10       All objections, except those as to the  
11       form of the question and the  
12       responsiveness of the answer, are reserved  
13       until the deposition is used or sought to  
14       be used in evidence.  
15                    \* \* \* \* \*

16       VIDEOPHOTOGRAPHER:  
17                We are now on the record. This  
18       is the videotaped deposition of John  
19       Frazier being conducted on November the  
20       29th, 2022, via Zoom, at approximately  
21       9:01 a.m. Would counsel present please  
22       now introduce themselves and the party  
23       they represent?  
24       MR. HUDDLELL:  
25                Kevin Huddell and John Arnold on

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1        behalf of the plaintiffs.  
2        MR. VANTASSELL:  
3                Good morning. Court VanTassell  
4        and John Troutman on behalf of BP  
5        America Production Company.  
6        VIDEOGRAPHER:  
7                Swear the witness, please.  
8                    \* \* \* \* \*

9                DR. JOHN FRAZIER  
10               325 Sugarwood Drive  
11               Farragut, Tennessee 37663  
12               having been duly sworn  
13               testified as follows:  
14               E X A M I N A T I O N  
15       BY MR. HUDDLELL:  
16               Q.    Good morning, Dr. Frazier, how are  
17               you?  
18               A.    Kind of sleepy, but other than  
19               that, okay.  
20               Q.    Okay. Well, I'm a little sleepy  
21               too, so we'll -- we'll try to make this as  
22               quick and painless as possible. The first  
23               thing I'd like to do is get you to say  
24               your full name for the record.  
25               A.    John Ronald Frazier.

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1        Q.    How are you currently employed?  
2        A.    I'm self-employed.  
3        Q.    What's the name of your company?  
4        A.    I'm not incorporated. It's just  
5        --  
6        Q.    Okay.  
7        A.    -- self-employed, sole  
8        proprietorship.  
9        Q.    Okay. And where do you currently  
10       reside?  
11       A.    325 Sugarwood Drive, Farragut,  
12       Tennessee.  
13       MR. HUDDLELL:  
14                Okay. I'd like to pull up Tab 1,  
15       Bill. Do you have that?  
16       VIDEOGRAPHER:  
17                I'm here today.  
18       MR. HUDDLELL:  
19                Oh, Gilley.  
20       VIDEOGRAPHER:  
21                Yes.  
22       MR. HUDDLELL:  
23                Did you get -- did you get what I  
24       sent to Bill? Probably not. Gilley?  
25       VIDEOGRAPHER:

8

1                Yes. I have what he did last time  
2       in tabs. What -- what tab are you  
3       looking for?  
4       MR. HUDDLELL:  
5                Oh, Tab 1.  
6       VIDEOGRAPHER:  
7                Tab 1. One moment. Is that what  
8       you're looking for, Kevin?  
9       MR. HUDDLELL:  
10               Well, so what -- what we're  
11       looking at right now is just a  
12       screenshot of your folder. But we --  
13       we -- if you can switch it to -- to the  
14       pdf Tab 1. If -- if not, I can do it.  
15                Okay. This is what we're going to  
16       mark as Exhibit 1. This is BP America  
17       Production Company's Limited Admission  
18       of Environmental Damage Pursuant to  
19       La. R.S. 30:29.  
20                (The document was marked for  
21       identification as "Exhibit 1" and  
22       attached to the transcript.)  
23       BY RM. HUDDLELL:  
24                Q.    Have you seen this before, Doctor?  
25                A.    Yes, I believe so.

9

1 Q. Okay. When would you have first  
 2 seen this?  
 3 A. I don't know the -- when I did.  
 4 Q. Okay. Do you -- have -- have you  
 5 -- have you read it?  
 6 A. Yes.  
 7 Q. Okay.  
 8 A. Yes. I read the submission from -  
 9 - prepared by HET.  
 10 Q. Okay. If we could look at page  
 11 four of this, top of page four, paragraph  
 12 17, I wanted to ask you a question about  
 13 it. Paragraph 17 says, "Pursuant to the  
 14 provisions of Louisiana Code of Civil  
 15 Procedure Article 1563 and Act 312, BP  
 16 makes a limited admission of  
 17 responsibility for environmental damage in  
 18 Limited Admission Areas 1, 2, and 3  
 19 depicted on the attached map, Exhibit A,  
 20 and described as follows". Do you see  
 21 that?  
 22 A. Yes.  
 23 Q. Okay. And then it lists three  
 24 different Limited Admission Areas,  
 25 correct?

11

1 that would render either the soil or  
 2 groundwater unfit for their intended use?  
 3 MR. VANTASSELL:  
 4 Same objection.  
 5 A. I -- I can only comment regarding  
 6 the -- the radionuclides. All that I saw  
 7 in the data were for naturally occurring  
 8 radionuclides unrelated to oil operations.  
 9 BY MR. HUDDLELL:  
 10 Q. Okay. So -- so the answer is --  
 11 is no, you -- you're not aware of any  
 12 constituents in the soil or groundwater  
 13 that would render the soil or groundwater  
 14 unfit for their intended uses?  
 15 MR. VANTASSELL:  
 16 Object to form. Mischaracterizes.  
 17 A. I'm not aware of any, because my  
 18 opinions regarding -- are only regarding  
 19 radionuclides.  
 20 BY MR. HUDDLELL:  
 21 Q. Okay. So what -- what is your  
 22 area of expertise, Dr. Frazier?  
 23 A. Health physics. That's the  
 24 science of radiation protection from --  
 25 from -- and -- and radiation safety, from

10

1 A. Yes.  
 2 Q. And are -- are you familiar with -  
 3 - with where those are located generally  
 4 on the property?  
 5 A. Yes.  
 6 Q. All right. Are you aware of any -  
 7 - any -- are you aware of the presence of  
 8 any radiation in Areas 1, 2, or 3 that  
 9 would make the soil or groundwater unfit  
 10 for their intended use?  
 11 A. No.  
 12 MR. VANTASSELL:  
 13 Object to form.  
 14 A. No.  
 15 MR. HUDDLELL:  
 16 Okay. But what was the objection?  
 17 MR. VANTASSELL:  
 18 It calls -- to the extent it calls  
 19 for a legal conclusion.  
 20 BY MR. HUDDLELL:  
 21 Q. Are you aware of any -- the  
 22 presence of any contaminants, or are you  
 23 aware of the presence of any constituents  
 24 of concern from oilfield operations in  
 25 Limited Area -- Admission Areas 1, 2, or 3

12

1 protecting people and the environment from  
 2 high doses of radiation.  
 3 Q. What are the potential risks that  
 4 are posed by the presence of high doses of  
 5 radiation in -- in people?  
 6 A. Well, at very high doses, the  
 7 risks are various health effects from very  
 8 high doses, much higher than you could  
 9 ever receive from environmental levels  
 10 like we have here.  
 11 Q. Okay. And what -- what are --  
 12 what are those risks? What are some of  
 13 those risks?  
 14 A. Well, that's a very, very broad  
 15 question. I've studied a lot of those.  
 16 For very high radiation doses, you can  
 17 have cancer causation. Those doses are  
 18 much, much higher than you could ever  
 19 receive from environmental levels like  
 20 this. And it -- have some non-stochastic  
 21 effects such as radiation burns, but that  
 22 would be from very, very high levels such  
 23 as nuclear weapons. But very -- several  
 24 different type of health effects both  
 25 stochastic and non-stochastic effects.

13

1 Q. What does stochastic mean?  
 2 A. Well, the -- the likelihood is  
 3 probabilistic and not dependent -- not as  
 4 dependent on the radiation dose, but the  
 5 likelihood is -- is probability related.  
 6 Non-stochastic would be the effect would  
 7 be determined by the magnitude of the  
 8 dose. The higher the dose, the worse the  
 9 effect, such as a radiation burn. And  
 10 those are effects that you get from very  
 11 close proximity to very -- very large  
 12 sources of radiation, external radiation,  
 13 or internal radiation for that matter.  
 14 Q. When we're talking about radiation  
 15 in the -- in the oilfield, what  
 16 radionuclides are we usually referring to?  
 17 A. Radium 226 and Radium 228.  
 18 Q. And so chronic exposure to Radium  
 19 226 and -- and Radium 228, can that lead  
 20 to the development or causation of cancer?  
 21 A. Only at very, very high doses from  
 22 internally deposited materials that would  
 23 be ingested or inhaled. But that's very,  
 24 very high doses.  
 25 Q. Is -- is there a -- a threshold

15

1 of the report -- of that document is  
 2 Roland -- I don't -- I don't see it in my  
 3 attachments here, but let's see. I don't  
 4 see it here. But Dr. Roland at Argon  
 5 National Lab. It's a book really.  
 6 Q. What -- what is the year of that  
 7 publication?  
 8 A. I'm not sure of the date. It's --  
 9 the title of it is, "Radium in Humans."  
 10 Robert Roland, R-O-L-A-N-D, I think that's  
 11 the way you pronounce it -- spell it.  
 12 Q. Does that describe the different  
 13 types of cancers that can be caused by  
 14 radium exposure?  
 15 A. Yes. Two types I think he lists.  
 16 Q. Okay. What -- what are those two  
 17 types?  
 18 A. Bone cancer and mandibular,  
 19 mandibles, jaw, bone cancers.  
 20 Q. And bone cancer would include  
 21 various types of leukemia; is that right?  
 22 A. No.  
 23 Q. Okay. Does -- does radium  
 24 exposure cause leukemia?  
 25 A. Not to my knowledge.

14

1 dose that would -- of -- from -- of an  
 2 exposure to Radium 226 and 228, that would  
 3 -- would likely cause cancer?  
 4 A. Yes. It's one of the -- the few  
 5 radionuclides that does have a threshold  
 6 for health effects that -- from ingestion  
 7 or inhalation intakes into the body, and -  
 8 - but it's very high, much higher than you  
 9 could ever receive from environmental  
 10 levels here.  
 11 Q. And what is that threshold dose?  
 12 A. When you say, "dose", it's -- it  
 13 would be an activity. I -- I'd have to  
 14 look that one up, but it's -- it's  
 15 described by a scientist publication at  
 16 Argon National Laboratory, and I -- I  
 17 don't recall the exact number, but it's of  
 18 -- of the order of 50 -- more than 50  
 19 million picocuries.  
 20 Q. The -- the Argon paper that you  
 21 referred to, is that something that is  
 22 included in your reference materials?  
 23 A. I'm almost certain it is, but let  
 24 me just check. I have a copy of my expert  
 25 report in the case, and the -- the author

16

1 Q. So it's -- it's your understanding  
 2 that exposure to radium does not result in  
 3 leukemia?  
 4 A. Not to my knowledge.  
 5 Q. Well, is -- is that -- is that  
 6 something that you -- you would consider  
 7 yourself an expert in as -- as to which  
 8 cancers radium exposure could cause?  
 9 A. Yes. And I think Roland's name is  
 10 spelled R-O-W-L-A-N-D. Maybe I spelled  
 11 that wrong. Yes.  
 12 Q. Okay. Okay. So I just -- I know  
 13 I've -- I guess I've already asked this,  
 14 but just to be clear, your expertise as a  
 15 health physicist would -- would include  
 16 knowing which types of cancers can be  
 17 caused by radium exposure, correct?  
 18 A. Yes.  
 19 Q. Okay. For -- for this case --  
 20 MR. HUDDLELL:  
 21 And let's pull up Tab 7, Gilley.  
 22 This is your -- your expert report.  
 23 Yeah. If we'd move to that page. This  
 24 is a copy of your expert report. We'll  
 25 mark it as Exhibit 2 to this

17

1 deposition.  
 2 (The document was marked for  
 3 identification as "Exhibit 2" and  
 4 attached to the transcript.)  
 5 BY MR. HUDDLELL:  
 6 Q. Do you have a copy of your report  
 7 in front of you, Dr. Frazier?  
 8 A. Yes. I have a copy of it. It's  
 9 dated October 14th, 2022. At the bottom  
 10 of the page, it shows the date there, I  
 11 think.  
 12 Q. Okay. I -- I've noticed that when  
 13 I -- when I open the pdf of your reports,  
 14 over the years, I've seen many of them,  
 15 the -- the title always at -- at the top  
 16 says, "Assessment of Radiological  
 17 Conditions on the ITCO Yard in Harvey,  
 18 Louisiana During the Time that", and I --  
 19 I was just curious if -- if you notice  
 20 that as well on your reports?  
 21 A. No. I don't know what you're  
 22 talking about. I mean, I -- I don't see  
 23 it on there.  
 24 Q. Okay.  
 25 A. No.

19

1 the documents.  
 2 Q. Yeah. I -- I just -- it's -- it's  
 3 on all of -- all of your reports. And I -  
 4 - I was just curious why that -- why that  
 5 was and I finally remembered to ask you.  
 6 But -- but you -- it -- it's just because  
 7 it's the -- it's basically the same  
 8 template that you use to -- to write your  
 9 reports?  
 10 A. Yes. The template that would  
 11 contain the elements or portions of the  
 12 report that comply with the Rule 26b I  
 13 think it is.  
 14 Q. Okay. All right. So in this  
 15 case, you -- you're of the opinion, number  
 16 one, there's no evidence of oilfield NORM-  
 17 impacted soil on the subject property,  
 18 right, that's first opinion?  
 19 A. That's correct.  
 20 Q. And did you -- did you do any  
 21 testing of the soil on the property?  
 22 A. No. I did not. The property is  
 23 periodically underwater and -- and only  
 24 accessible by boat and so I -- I saw no  
 25 evidence of -- of oilfield NORM in the --

18

1 Q. What's that?  
 2 A. I -- I don't see it on the page  
 3 here.  
 4 MR. HUDDLELL:  
 5 Yeah. Gilley, can I share my  
 6 screen?  
 7 VIDEOGRAPHER:  
 8 Let me stop sharing.  
 9 MR. HUDDLELL:  
 10 Okay.  
 11 BY MR. HUDDLELL:  
 12 Q. I don't know if -- if you can see  
 13 that, that -- at -- at the top, it --  
 14 here, it has that title of the ITCO Yard.  
 15 A. Yeah. I think the genesis of this  
 16 is that, over the years, I use the same  
 17 format in terms of the rule -- Federal  
 18 Rule 26b or whatever, and since I go back  
 19 to a document that has that format,  
 20 subsequent documents have the same format  
 21 for that, the title and the introduction,  
 22 opinions and so forth, that that's  
 23 probably what it goes back to is that.  
 24 Q. Okay.  
 25 A. I didn't realize it was on -- on

20

1 or NORM -- NORM-impacted soil on the  
 2 property.  
 3 Q. In -- in the past, you have gone  
 4 to -- to various properties that are  
 5 involved in litigation like this and  
 6 you've tested the soil for -- for  
 7 radiation, right?  
 8 A. Yes. If there's indication from  
 9 plaintiffs that there is NORM-impacted  
 10 soil, we do. If the -- if the land is  
 11 above water, effecting the soil.  
 12 Q. Okay. And how -- how do you --  
 13 those times that you do go out and test  
 14 for radiation in the soil, how do you do  
 15 that?  
 16 A. We test for radioactive materials  
 17 in the soil.  
 18 Q. Right.  
 19 A. That's done -- that's done with  
 20 the -- the initial part of it is reviewing  
 21 the history of the -- the data produced by  
 22 plaintiffs in the -- in the -- for the  
 23 site. But to go out to do the  
 24 radiological characterization, initially  
 25 we use a radiation detector, a gamma

21

1 radiation detector, held near the surface  
 2 of the soil and maneuver -- move that over  
 3 the soil to see if I get a -- a gamma  
 4 radiation reading that would exceed the  
 5 natural background gamma radiation reading  
 6 in the soil. And then subsequent to a  
 7 survey like that, a radiation survey, if  
 8 there are areas -- even if they're not  
 9 areas elevated, we'd be collecting surface  
 10 soil samples for analysis for  
 11 concentrations of Radium 226 and Radium  
 12 228 in the soil.  
 13 Q. Okay. But in this case, you  
 14 didn't -- you didn't go out there and --  
 15 and test the soil for radioactive  
 16 materials?  
 17 A. That's right. I saw no reason to  
 18 do that.  
 19 Q. Okay. Opinion number two is, the  
 20 ratios of concentrations of radium  
 21 isotopes in the water from all monitoring  
 22 wells are consistent with native soils and  
 23 do not indicate the presence of NORM from  
 24 oilfield operations; is that right?  
 25 A. That is correct.

23

1 groundwater would become contaminated by  
 2 oilfield NORM?  
 3 MR. VANTASSELL:  
 4 Object to form.  
 5 A. Well, oilfield NORM coming with  
 6 the produced water can cause the water  
 7 that it's mixed with or goes into to be  
 8 NORM impacted, and you can also have  
 9 formation of scale in pipes and equipment  
 10 and -- and tank bottoms and such in oil  
 11 production equipment where you can have a  
 12 concentration of that radium, more so than  
 13 you have in the produced water itself.  
 14 But that -- that scale of formation is  
 15 very insoluble and it could be released  
 16 into the water, but it's very insoluble  
 17 and would precipitate.  
 18 BY MR. HUDDLELL:  
 19 Q. Okay. Well, let's -- let's look  
 20 at page seven of your report, Table --  
 21 Table 1. So Table 1, what does -- what  
 22 does Table 1 show us?  
 23 A. Well, the title of this table  
 24 tells you what it is. It's a Summary of  
 25 Laboratory Measurements of Groundwater

22

1 Q. Okay. Now, we -- if -- if you --  
 2 if you had found radium isotopes that  
 3 indicated the presence of NORM from  
 4 oilfield operations, how would that -- how  
 5 would that NORM have gotten in the water?  
 6 That's a terrible question.  
 7 MR. VANTASSELL:  
 8 Object to form.  
 9 BY MR. HUDDLELL:  
 10 Q. How -- how can NORM from oilfield  
 11 operations get into the groundwater?  
 12 A. Oh okay, from oilfield operations?  
 13 Yeah. Actually, in -- in the produced  
 14 water, the -- there is various levels of  
 15 Radium 226 and 228, depending upon the  
 16 formation from which the produced water  
 17 comes, and that produced water, when  
 18 released into a pit or out of a well, that  
 19 is a -- a source of Radium 226 and 228  
 20 into the water. But we already have  
 21 naturally occurring Radium 226 and 228 in  
 22 water. All -- all water has Radium 226  
 23 and 228 in it.  
 24 Q. Okay. If -- what -- what is the  
 25 mechanism though by which the -- the

24

1 Samples.  
 2 Q. Okay. And so at -- looks like at  
 3 LT-1, there was no testing at the Eberline  
 4 Lab; is that right?  
 5 MR. VANTASSELL:  
 6 Object to form.  
 7 A. That's correct.  
 8 BY MR. HUDDLELL:  
 9 Q. Okay. But there was testing at  
 10 the Pace Lab, correct?  
 11 A. Well, the Eberline Lab had  
 12 elemental interference. It was not  
 13 defined what that elemental interference  
 14 was, but it was what -- it's stated in the  
 15 lab report, so they did not report any  
 16 results. But the Pace Lab reported both  
 17 results for Radium 226 and Radium 288, the  
 18 concentrations of each and the  
 19 uncertainties of each. I also was able to  
 20 find the TDS, the total dissolved solids,  
 21 for that sample in -- in another report  
 22 there -- there. I think it was from the  
 23 table of the ICONS report.  
 24 Q. Okay. So the -- the -- the --  
 25 Eberline is the Lab that you typically

25

1 use; is that correct?  
 2 A. Yes.  
 3 Q. Okay. Do you consider it a -- a  
 4 better lab than the Pace Lab or more  
 5 reliable or anything like that?  
 6 A. They're comparable labs. Both are  
 7 -- are reputable laboratories.  
 8 Q. Okay. All right. And so what --  
 9 why did you conclude at LT-1, based on the  
 10 Pace -- Pace Lab results, that the NORM  
 11 that was found in the groundwater was not  
 12 oilfield related?  
 13 A. Two things. The Radium 228  
 14 concentration was actually greater than  
 15 the Radium 226, including the  
 16 uncertainties of both. That's the first  
 17 indication that it's not oil-produced  
 18 water. The second thing is, you're  
 19 looking at the activity concentration per  
 20 mass of solids, solids being 18.8 grams  
 21 per liter, and -- so, for instance, Radium  
 22 228 is 3.6 picocuries per liter and that's  
 23 in a sample that has 18.8 grams per liter.  
 24 So that's a concentration there of 3.6  
 25 divided by 18.8 is within the range you

27

1 - that you've -- that you've done?  
 2 A. Well, the initial ratios of Radium  
 3 226 and 228 in soil is -- is on several of  
 4 the -- the references I listed here. The  
 5 Meriwether documents we have what the  
 6 normal ratio is. It's approximately 1:1  
 7 in normal soil, a little bit more Radium  
 8 228. But we also have the little bit  
 9 higher Radium 228 than 226 in new produced  
 10 water when it's first brought out of the  
 11 ground. Subsequent to that though, is  
 12 that we have the natural radioactive decay  
 13 of both of those because they're taken  
 14 away from their parent, the parents  
 15 plural. Respectively, that's the -- the  
 16 parent of Radium 226 is Uranium 238 and  
 17 the parent of -- ultimately, the parent of  
 18 Radium 228 is Thorium 232. So being taken  
 19 away from their parents in -- in the  
 20 formation from which the produced water  
 21 came, they would be following their half  
 22 lives and the Radium 228 concentration  
 23 would continue to decrease faster than  
 24 the Radium 226 concentration decreases.  
 25 And that continues to be the case. It's a

26

1 would find for natural Louisiana solids in  
 2 -- in the radium in natural Louisiana  
 3 solids in water.  
 4 Q. Okay. So over the years, I've  
 5 asked you about your -- your theory of --  
 6 of the -- the ratios indicating -- being  
 7 an indicator of whether the NORM is -- is  
 8 -- is natural or from -- from produced  
 9 water, right?  
 10 MR. VANTASSELL:  
 11 Object to form.  
 12 BY MR. HUDDLELL:  
 13 Q. We talked about that several  
 14 times?  
 15 MR. VANTASSELL:  
 16 Object to form.  
 17 A. I wouldn't call it a theory. I  
 18 think I'd call it a scientific fact. But  
 19 yes, you've asked me before.  
 20 BY MR. HUDDLELL:  
 21 Q. Okay. And I'm -- I'm just  
 22 wondering if -- if now and -- on November  
 23 29th, 2022, do you -- are there any  
 24 scientific papers that -- that talk about  
 25 this -- this ratio analysis that -- that -

28

1 combination of -- of three -- three or  
 2 more factors that we have here.  
 3 Q. Okay. And I was just wondering if  
 4 there's a -- a published scientific study  
 5 yet that -- that -- that recognizes that  
 6 that is a method of determining whether  
 7 the radium that's being found in the  
 8 groundwater is natural or from -- or from  
 9 produced water?  
 10 MR. VANTASSELL:  
 11 Object to form. Asked and  
 12 answered.  
 13 A. I -- I don't know of any specific  
 14 scientific paper, but I do know that the  
 15 International Atomic Energy Agency  
 16 publication, Radium in the Environment,  
 17 addresses radium in -- in groundwater and  
 18 discusses the isotopic ratios in that.  
 19 BY MR. HUDDLELL:  
 20 Q. Okay. So let's move to sample ID  
 21 LT-2. What -- what about these results  
 22 shows that this would be natural and not -  
 23 - not from the oilfield?  
 24 A. Well, the ratios of 226 and 228  
 25 including the uncertainties are

29

1 approximately 1:1, if you include the  
 2 uncertainties there. Again, the Eberline  
 3 data is consistent with that. The Pace  
 4 Lab data is a -- a little bit out of line  
 5 with that, but not too far. But still,  
 6 both of those are consistent with that,  
 7 that the ratios are approximately 1:1,  
 8 including the uncertainties, the  
 9 measurements. We also have a duplicate, I  
 10 believe there. The lab duplicate of LT-2,  
 11 and it's -- it also shows that.  
 12 Q. Okay. Would you agree that at LT-  
 13 1, the -- the radium -- well, would you  
 14 agree -- let me start over. The -- the  
 15 radium that's found at LT-1, is that  
 16 greater than you would naturally find if  
 17 the TDS had been lower?  
 18 A. I'm not sure --  
 19 Q. Let me --  
 20 A. -- I follow that question.  
 21 Q. Yeah. Yeah.  
 22 A. Radium concentrations -- I'll just  
 23 answer, the radium concentrations that are  
 24 observed here, measured here, are  
 25 consistent with that amount of solids.

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1 chlorides in the groundwater from oilfield  
 2 operations, would -- would that -- would  
 3 that result in -- in higher concentrations  
 4 of radium in groundwater?  
 5 MR. VANTASSELL:  
 6 Object to form.  
 7 A. Yes, that's the theory. Yes.  
 8 BY MR. HUDDLELL:  
 9 Q. Okay.  
 10 A. The higher the concentrations of  
 11 chlorides, it brings the natural radium in  
 12 the soil into the -- into solution.  
 13 Q. Okay. So -- so I thought you were  
 14 saying that the TDS itself is an  
 15 indication of -- of -- of radium. Like  
 16 the -- the TDS includes the radium  
 17 particles; is that right?  
 18 MR. VANTASSELL:  
 19 Object to form.  
 20 A. It's hard to answer that question.  
 21 The amount of radium by mass, by mass, is  
 22 very, very small. A picocurie of Radium  
 23 226 is a picogram, approximately, a  
 24 trillionth of a gram. So the radium by  
 25 mass is a trace metal, so not much mass

30

1 Q. Okay. All right. So I believe  
 2 you told me before that the -- the  
 3 presence of the TDS will -- will draw the  
 4 naturally occurring radium in the soil --  
 5 in the -- in the groundwater, will draw  
 6 that into solution; is that -- is that  
 7 right?  
 8 MR. VANTASSELL:  
 9 Object to form.  
 10 A. Not at all.  
 11 BY MR. HUDDLELL:  
 12 Q. Okay. Can you explain the affect  
 13 that TDS has on the radium concentration  
 14 of the groundwater?  
 15 A. Well, it -- you know, the more  
 16 solids you have in the water, whether or  
 17 not it's related -- near an oilfield site  
 18 or whatever, the more solids you have in  
 19 the water, the more radium you'll have.  
 20 The -- the radium is in the solids. So if  
 21 you just have more natural solids in the  
 22 water, then you'll have more radium in the  
 23 water.  
 24 Q. Okay. If you have -- if -- if the  
 25 TDS is a result of, for example, high

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1 that you have there. It typically is in -  
 2 - as -- as a chloride would be present  
 3 there in the S -- with the S of TDS that  
 4 you have. But the more solids you have in  
 5 the water, the more radium you have. And  
 6 that's -- that's true.  
 7 BY MR. HUDDLELL:  
 8 Q. And if the TDS got there from the  
 9 oilfield operations, wouldn't you say then  
 10 that the increased radium also got there  
 11 from the oilfield operations?  
 12 MR. VANTASSELL:  
 13 Object to form.  
 14 A. I don't know where the TDS came  
 15 from, but if you have higher TDS present  
 16 in a formation and if -- if that TDS  
 17 originated from produced water, yes, that  
 18 would be the case.  
 19 BY MR. HUDDLELL:  
 20 Q. Okay. Do you know one way or  
 21 another whether the 18,800 milligrams per  
 22 liter of TDS, for example, at LT-1 came  
 23 from oilfield operations or not?  
 24 A. I don't know.  
 25 Q. Okay. Assuming that they did,



<p style="text-align: right;">33</p> <p>1 would you agree then that the increased 2 radiation in the groundwater was a result 3 of the oilfield operations that -- that 4 contributed to the TDS? 5 MR. VANTASSELL: 6 Object to form. 7 A. No. I -- I can't say that one way 8 or the other because the -- I -- I'm not 9 an expert in the origin of the TDS we have 10 here. Now, there may be other analyses of 11 that water that would show that there's 12 other constituents in the water that would 13 be related to oil production, but the -- 14 the radium levels here do not indicate 15 that we have this from oil production. 16 And that's all I did my opinions on, the 17 radionuclides. 18 BY MR. HUDDLELL: 19 Q. Okay. And -- and then there's a - 20 - a second mechanism I think you said that 21 TDS makes the radium that's naturally in 22 the soil more mobile? 23 A. It -- it's the chlorides in the 24 TDS. 25 Q. Okay.</p>	<p style="text-align: right;">34</p> <p>1 A. Not -- not just the other solids 2 in there, but it's the chlorides that 3 makes it more mobile. 4 Q. Okay. 5 A. And as you -- as you decrease the 6 chloride levels, the radium levels 7 decrease. 8 Q. And that's because the chlorides 9 make the radium more mobile? 10 A. That's certainly the theory. 11 That's what the International Atomic 12 Energy Agency report on radium in the 13 environment shows. 14 Q. What is the date of that article? 15 A. There's two different -- two 16 different reports. Let me look here. 17 1990, that's on page -- page 16 of my 18 report. It's Technical Report number 310. 19 There are two volumes. And there's also 20 2014 Technical Report. It was a revised 21 edition. Technical Report Series 476. 22 It's on page 16 of my expert report. 23 Q. Okay. Did you look at the 24 chloride levels at LT-1 to form your 25 opinion?</p>
<p style="text-align: right;">35</p> <p>1 A. I don't recall specifically 2 looking at those. Generally, as you get 3 higher TDS like you have here, the 4 chloride levels are somewhere between 50 5 and 60 percent of the TDS, but I didn't 6 look at it for it. 7 MR. HUDDLELL: 8 Okay. I'm going to mark as 9 Exhibit 3 your report from the 10 Iberville Parish School Board case. 11 (The document was marked for 12 identification as "Exhibit 3" and 13 attached to the transcript.) 14 BY MR. HUDDLELL: 15 Q. Okay. All right. Do you see 16 this, Dr. Frazier? 17 A. Yes. I think that's one dated 18 March 31st, 2016. 19 Q. Yes, sure is. And are you aware 20 where -- where the school board property 21 is in relation to the -- with Levert 22 property? 23 A. Yes. 24 Q. Okay. All right. So in the 25 school board case, in your report in</p>	<p style="text-align: right;">36</p> <p>1 Exhibit 3, which we've -- which we've -- 2 which we've marked as Exhibit 3, your 3 opinion number two says that, "Results of 4 laboratory analysis of groundwater samples 5 from the subject property show the 6 concentrations of radioactive materials in 7 groundwater on the property are within the 8 range of natural background radionuclide 9 concentrations in Louisiana groundwater, 10 except for water samples from two wells, 11 SB-5 and MW-2"; do you see that? 12 A. Yes. And that's correct. 13 Q. Okay. And is that still your 14 opinion today? 15 MR. VANTASSELL: 16 Object to form. 17 A. Well, at the time the water was 18 sampled from these wells, that was the 19 opinion. I don't know what the current 20 concentrations are in these wells. I 21 think they were plugged and abandoned and 22 plugged. 23 BY MR. HUDDLELL: 24 Q. Okay. All right. And so what was 25 it about the two wells, SB-5 and MW-2,</p>

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1 that led you to -- to the conclusion that  
 2 those were -- that those were consistent  
 3 with oilfield NORM?  
 4 A. The concentration of Radium 226  
 5 compared with -- compared to the  
 6 concentration of Radium 228 in water in  
 7 both of those samples, were greater than  
 8 one, even including the uncertainty of the  
 9 measurements. So the -- it indicated that  
 10 the -- it was all produced water,  
 11 indicated that because the Radium 228 had  
 12 undergone radioactive decay.  
 13 Q. Are you aware that HET has written  
 14 a report in this case -- well, their case  
 15 -- that -- wherein they -- they say that  
 16 the chlorides that we're finding at -- at  
 17 Limited Admission Area 1 in the  
 18 groundwater, are a result of the migration  
 19 of constituents from the school board  
 20 property?  
 21 MR. VANTASSELL:  
 22 Object to form.  
 23 A. Yes, I have read that.  
 24 BY MR. HUDDLELL:  
 25 Q. Okay. Do you have any reason to

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1 especially the chloride, to keep it moving  
 2 along, at very high concentrations of  
 3 chlorides, then the radium will be -- will  
 4 not be moving at all.  
 5 BY MR. HUDDLELL:  
 6 Q. Okay. Well, if -- if HET is right  
 7 and the chlorides have moved from the  
 8 school board property onto to the Levert  
 9 property, would you agree that it would  
 10 have also transported some of the radium  
 11 as well?  
 12 MR. VANTASSELL:  
 13 Object to form.  
 14 A. That's certainly the theory, but  
 15 the concentrations would have to be very  
 16 high, and I don't know what -- how -- what  
 17 the concentrations were necessarily to  
 18 cause that movement.  
 19 BY MR. HUDDLELL:  
 20 Q. Okay.  
 21 A. There's radium -- there's radium  
 22 in all water and in all soil. So the --  
 23 the presence of -- I saw no indication of  
 24 a radium plume from that site.  
 25 Q. Okay.

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1 dispute that?  
 2 A. No. The transport of chlorides is  
 3 not my area of expertise.  
 4 Q. Okay. How about the transport of  
 5 radium in groundwater?  
 6 A. Yes, to a degree. Yes, what the  
 7 measurements would show. Yes.  
 8 Q. Okay. All right. Do you know  
 9 whether radium in the groundwater is more  
 10 or less mobile than -- than chlorides?  
 11 A. I can't answer that. I don't  
 12 understand the question.  
 13 Q. Yeah. Sorry. So the -- will --  
 14 will radium -- will radium move through  
 15 the groundwater at -- at the same rate as  
 16 -- as chlorides, do you know?  
 17 MR. VANTASSELL:  
 18 Object to form.  
 19 A. I can't really answer that as  
 20 asked. Radium being a trace metal must be  
 21 carried along with something, because  
 22 radium is absorbed onto soil particles,  
 23 especially clays very readily. And unless  
 24 you have an elevated chloride or something  
 25 like -- something else, the formation,

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1 MR. HUDDLELL:  
 2 Can we take a five minute break?  
 3 THE WITNESS:  
 4 Sure.  
 5 MR. HUDDLELL:  
 6 Okay.  
 7 VIDEOGRAPHER:  
 8 We are now off the record. The  
 9 time is 9:48.  
 10 (A brief recess followed.)  
 11 VIDEOGRAPHER:  
 12 We're now returning to the record.  
 13 The time is 9:55.  
 14 BY MR. HUDDLELL:  
 15 Q. Dr. Frazier, is it correct that  
 16 you didn't look at whether or not the  
 17 radium would have migrated from the school  
 18 board property onto the Levert property?  
 19 MR. VANTASSELL:  
 20 Object to form.  
 21 A. I looked at the concentrations of  
 22 Radium 226 and 228 in the wells of the  
 23 Levert property. I saw no data that  
 24 indicated what was between those samples  
 25 and the school board property, which would



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1 have indicated whether there was migration  
 2 from that. The data on the -- the  
 3 groundwater concentrations on the Levert  
 4 property were consistent with naturally  
 5 occurring radium in solids.  
 6 BY MR. HUDDLELL:  
 7 Q. All right. Does Radium 226 and  
 8 228 migrate at the same rate? In other  
 9 words, is there a difference in the  
 10 mobility of Radium 226 versus 228?  
 11 MR. VANTASSELL:  
 12 Object to form.  
 13 A. Not to -- not to my knowledge. It  
 14 depends on what matrix each of them is in,  
 15 but they're the same element, so they  
 16 would -- I don't know that there's any  
 17 difference in their migration, unless it's  
 18 tied to the half-lives. But I don't --  
 19 I've never seen anything that says they  
 20 are different migrations.  
 21 BY MR. HUDDLELL:  
 22 Q. Okay. On the school board  
 23 property, you did find at -- at least at  
 24 two sample locations, that there was  
 25 oilfield NORM in the groundwater, correct?

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1 Radium 226, then it'll be gone.  
 2 BY MR. HUDDLELL:  
 3 Q. Okay.  
 4 A. Except -- except for the natural  
 5 radium in native Louisiana soils.  
 6 Q. Understood. And if the source is  
 7 not removed, then we'll still have half of  
 8 the Radium 226 on the school board  
 9 property that we had today with -- in  
 10 1,600 years?  
 11 MR. VANTASSELL:  
 12 Object to form.  
 13 A. That's -- you added -- you added a  
 14 -- a clause there that you said, if the  
 15 source is not removed. I don't know  
 16 whether the source is removed or not, but  
 17 I -- it seems like I read that there was a  
 18 remediation of the school board property.  
 19 BY MR. HUDDLELL:  
 20 Q. Is it your understanding there was  
 21 a remediation of the groundwater at the  
 22 school board?  
 23 MR. VANTASSELL:  
 24 Object to form.  
 25 A. I think there was a remediation of

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1 A. Certainly, yes. The results were  
 2 consistent with oilfield NORM in  
 3 groundwater.  
 4 Q. And the Radium 226 that is from  
 5 the oilfield operations on the school  
 6 board property, when will -- when will  
 7 that -- when will that degrade to an -- an  
 8 undetectable level?  
 9 MR. VANTASSELL:  
 10 Object to form.  
 11 A. Well, you can always detect Radium  
 12 226 in groundwater, if you have sensitive  
 13 enough instrumentation and analysis. But  
 14 the half-life of Radium 226 is 1,600  
 15 years. That's the half-life of Radium 226  
 16 in native Louisiana soils too.  
 17 BY MR. HUDDLELL:  
 18 Q. Okay. So the Radium 226 that was  
 19 from the oilfield operations found on the  
 20 school board property will still be there  
 21 in 1,600 years; is that right?  
 22 MR. VANTASSELL:  
 23 Object to form.  
 24 A. Depends upon whether the source is  
 25 removed. If the source is removed to the

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1 a pit and some soil -- above ground soils  
 2 there too that was signed off on by the --  
 3 or done -- performed by the Louisiana  
 4 Department of Natural Resources.  
 5 BY MR. HUDDLELL:  
 6 Q. The -- the radium that's already  
 7 in the groundwater that you detected in --  
 8 in your school board report, that's going  
 9 to stay in the -- in the groundwater  
 10 though for more than 1,600 years, correct?  
 11 MR. VANTASSELL:  
 12 Object to form.  
 13 A. No. No. It -- it -- as the  
 14 chloride levels decrease, the radium will  
 15 be absorbed onto the soil particles and be  
 16 a part of the natural soil particles. All  
 17 -- all soil in Louisiana -- on average,  
 18 every gram of soil in Louisiana, on  
 19 average, has one picocurie of Radium 226  
 20 in it and about one picocurie of Radium  
 21 228. So there's a huge amount of  
 22 naturally occurring radium in -- in soil  
 23 in which groundwater is in contact  
 24 naturally.  
 25 BY MR. HUDDLELL:

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1 Q. I understand that. But the -- the  
 2 Radium 226 that was deposited there from  
 3 the oilfield operations in the groundwater  
 4 on the school board property, 1,600 years  
 5 from now, you'll still have half of much  
 6 as you -- as you do know, correct?  
 7 MR. VANTASSELL:  
 8 Object to form. Asked and  
 9 answered.  
 10 A. I think I did answer that, but it  
 11 certainly would be present in that  
 12 location, but not necessarily in the  
 13 water, the groundwater in that location.  
 14 It could well be absorbed -- it will be  
 15 absorbed as the chloride levels decrease,  
 16 absorbed onto the soil particles.  
 17 MR. HUDDLELL:  
 18 All right. That's all the  
 19 questions I have.  
 20 THE WITNESS:  
 21 Wow.  
 22 MR. VANTASSELL:  
 23 No questions for BP. Thank you  
 24 for your time, Dr. Frazier, and Kevin.  
 25 THE WITNESS:

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1 REPORTER'S PAGE  
 2 I, Lori B. Overland Certified Court  
 3 Reporter, in and for the State of  
 4 Louisiana, the officer, as defined in Rule  
 5 28 of the Federal Rules of Civil Procedure  
 6 and/or Article 1434(b) of the Louisiana  
 7 code of Civil Procedure, before whom this  
 8 sworn testimony was taken, do hereby state  
 9 on the Record  
 10 That due to the interaction in the  
 11 spontaneous discourse of this proceeding,  
 12 dashes (--) have been used to indicate  
 13 pauses, changes in thought, and/or talk  
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 15 a Court Reporters's transcription of  
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 17 not indicated that words or phrases have  
 18 been left out of this transcript;  
 19 That any words and/or names which could  
 20 not be verified through reference material  
 21 have been denoted with the phrase  
 22 "(inaudible)."  
 23 \_\_\_\_\_  
 24 Lori Overland C.C.R.  
 25 # 97083

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1 Thank you very much.  
 2 THE VIDEOGRAPHER:  
 3 This concludes this deposition.  
 4 We're now off the record. The time is  
 5 10:01.  
 6 THE DEPOSITION CONCLUDED AT 10:01 A.M.  
 7 \* \* \* \* \*  
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1 CERTIFICATION  
 2 I, Lori B. Overland, Certified Court Reporter in  
 3 and for the State of Louisiana, as the officer before  
 4 whom this testimony was taken, do hereby certify that  
 5 the above referenced individual to whom oath was  
 6 administered, after having been duly sworn by me upon  
 7 authority of R.S. 37:2554, did testify as hereinbefore  
 8 set forth in the foregoing pages, that this testimony  
 9 was reported by me in the stenomask reporting method,  
 10 was prepared and transcribed by me or under my personal  
 11 direction and supervision, and is a true and correct  
 12 transcript to the best of my ability and understanding;  
 13 that the transcript has been prepared in compliance  
 14 with transcript format guidelines required by statute  
 15 or by rules of the board, that I have acted in  
 16 compliance with the prohibition on contractual  
 17 relationships, as defined by Louisiana Code of Civil  
 18 Procedure Article 1434 and in rules and advisory  
 19 opinions of the board; that I am not related to counsel  
 20 or to the parties herein, nor am I otherwise interested  
 21 in the outcome of this matter.  
 22 \_\_\_\_\_  
 23 Lori Overland C.C.R.  
 24 # 97083  
 25

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